



Improved Power Ratings for Standard Chip Resistors

MIL-PRF-55342

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Overview



- Specification Background.
 - 0402 vs. Penny
- Impact of the Specification.
- Non-Standard Chip Resistors.
- Standardization Challenges.
 - Acceptable Transition of New Power Ratings.
 - Testing Sample and Protocol.
 - Evaluation of Data.
 - Military/Industry Coordination.
- Results of Coordination.
 - Sample of New Power Ratings.
- Benefits.



Specification Background



- Originated 1971 to cover subminiature chip type electronic resistors in hybrid microcircuit applications.
- The scope of the specification increased significantly in the 1990s with the move to surface mount applications. "Chips mounted on printed circuit boards".



0402 vs. Penny



Courtsey of Bob Sutterlin
State of the Art,



Impact of the Specification



- Large Inventory Impact
 - Currently around 2,600 NSNs assigned to MIL-PRF-55342 standard parts in the DoD inventory system.
- Affects Critical Weapons Systems
 - Over 200 weapons system (Nimitz carriers, F/A-18, B-2, Patriot and TOW missile, etc.).



Nonstandard Chips



- Received feedback that OEM designers were wanting to use nonstandard chips with a higher power rating in their new design.
- SCDs were being created on these nonstandard parts and were entering the inventory system.
- Original power ratings were conservatively based on hybrid microcircuit applications.
- An upgrade of the power rating for the standard parts was needed.



Standardization Challenges



- The standardization of new power rating that would better reflect the capability of the standard parts.
- Options:
 - Develop 13 new specification sheets with the new power ratings.
 - Thousands of new standard part numbers would be required.
 - The original power rating becoming obsolete.
 - Still support those parts in the inventory system.



Standardization Challenges



Or

- Increase the power rating in the existing 13 specification sheets.
- Using the same material, design, and construction of the existing chips.
- No new standard part numbers would be needed.
- Would require support of the military departments, OEMs and all QPL manufacturers.



Standardization Challenges

- Develop a test protocol for consistency and evaluation.

Samples for life testing

3 sizes from thick film (2512, 1005, 0502)

3 sizes from thin film (same sizes)

Each size would have 102 pieces

(34 high, 34 critical, 34 low resistance values)

- 612 total chip resistors for test.
- Timeframe for testing
 - 2 years to complete testing.



Standardization Challenges

- Evaluation of the new ratings test data.

After completion of the testing the QPL Manufacturers sent their data to DSCC-VQP for evaluation against the ER failure rate system criteria.

No problems and approval was granted.

- Based on the test data, drafts with the proposed changes to the existing power rating were distributed for coordination.



Military/Industry Coordination



- Military & other Agencies
 - Air Force – 11, 19, 99
 - Army – CR, AR, AT, AV, CR4
 - Navy – EC, AS, CG, MC, OS
 - NASA – NA
- Industry
 - OEMs: Boeing, Lockheed-Martin, Raytheon & EIA G-11 Committee
 - QPL manufacturers: State of the Art, Mini-Systems, Vishay Dale, Vishay Thin Film, Vishay Israel, IRC, and Piconics.



Results of the Coordination

- Broad based support in the military and industry for the standardization template developed by the Army and DSCC.
- The dating of MIL-PRF-55342H, Amendment 1, and 13 specification sheets of 15 October 2007.
- New power ratings that are reflective of the capability of the existing design.
 - No need to established a new cadre of standard part numbers.
 - No changes to existing part lists, NSNs and inventories of millions of parts that have been produced.



Sample of New Power Ratings

MIL-PRF-55342	PREVIOUS MIL-PRF-55342H		PROPOSED MIL-PRF-55342H Amendment 1	FINAL DISPOSITION MIL-PRF-55342H Amendment 1
	pwr (mW)		pwr (mW)	pwr (mW)
	Thick	Thin		
/1 (0502)	20	10	50	50
/3 (1005)	100	50	200	200
/9 (2512)	750 (fb)	500 (fb)	1.0W	1.0W
	1W (cb)	500 (cb)		



Benefits



- Over \$8 million in cost avoidance by avoiding new standard part introductions.
- Multiple sources were maintained for all 13 specification sheets. All 7 QPL manufacturers made the transition.
- Thousands of existing QPL products in distributors inventories that are capable of the new improved power ratings.
- Precludes costly SCDs on nonstandard parts.